STATE OF KNOWLEDGE AND INQUIRY

Beyond a basic understanding of how widely diffused personal computers and Internet linkages have become in the United States, our knowledge of the implications of IT for the home is limited. We have yet to model and explain the IT adoption dynamics of the mid- to late 1990s, and still have no real sense of the impacts of IT on the home.[5] Data that reliably explain national patterns of computer and Internet access and use originate from six institutions (table 1), three of which are commercial market research organizations.[6] Of the eight major datasets available for national analysis (appendix A), five focus almost exclusively on the Internet. There is thus less immediate attention on the role and purpose of personal computing in the home, and a near total neglect of computing/information media such as interactive CD-ROMs and educational and entertainment software.

DATA RESOURCES

Investigation of potential sources of data for analyzing access to, and use of, IT in the home yielded few resources that could be used to generate statistically valid findings that could be generalized across the United States. Few publicly available data collection efforts represent national probability samples, which seriously limits the degree to which conclusions can be drawn about the U.S. population. In all, six sources of data can be used to describe American patterns of IT adoption and use in the home. These sources, together with a description of the data they collect, are presented in table 1. (The methodology for constructing this data resource inventory and more detailed descriptions of available data are presented in appendix A.) Table 1 also includes a survey focused on public attitudes toward science and technology (as opposed to acquisition and use of technology) that also asks some questions about IT access and use.

As noted, three of the six institutions are commercial market research firms. Prices for their IT data are relatively costly, although they vary considerably, ranging from $1,500 to $10,000 for a single year or single dataset. While publicly available, the expense of these datasets may inhibit scholarly research; moreover, because the data are proprietary, it is unlikely that highly detailed analyses may be published or otherwise reported in the public domain.

These data resources pose other limitations as well. For example, although a rich source of information, Georgia Tech's World Wide Web (WWW) User Survey is a nonprobability sample and cannot be used to make statistical inferences to the U.S. population. Also, only the Pew Research Center for the People and the Press and the Bureau of the Census collect detailed data on home computing. Unfortunately, neither of these organizations field their surveys on a routine basis, so there is no predictable and reliable source of national data on home computer access or use; this is particularly problematic given the rapid diffusion of PCs over the past several years.

Most of the data resources derive from national, random digit dial telephone surveys that yield national probability samples. Such methods can, however, generate different estimates of home IT use. Summaries of random digit dial techniques can be found in Clemente (1998) and Riccobono (1986). Hoffman, Kalsbeek, and Novak (1996) provide a detailed comparison and discussion of the methods and estimates generated by the CommerceNet/Nielsen Internet Demographic Survey, the American Internet User Survey, and the Pew Research Center for the People and the Press' IT in the American Home Survey.[7] The computer and Internet supplements to the Current Population Survey (CPS) are the only national probability samples that do not derive from telephone sampling frames; household samples are based on the actual 1990 census. All of these surveys collect a variety of detailed information related to user demographics and Internet (or computer) usage patterns; Internet data are particularly focused on types of use (e-mail versus other services) and intensity of use (frequency and duration of access). Only the CPS has traditionally collected data related to respondents' race/ethnicity.[8]

[5]While a certain amount of insightful research was conducted on adoption dynamics in the early 1980s, this describes early adopter behaviors only.

[6]There are three other commercial research firms that provide data on IT in the home—the NPD Group, PC Meter, and Media Metrix. These are *not* included here for reasons related to their documentation and generalizability (appendix A).

[7]Hoffman, Kalsbeek, and Novak find that most differences in these survey estimates can be accounted for by how Internet use is defined in the survey and how population measures are weighted.

[8]The CommerceNet/Nielsen Internet Demographic Survey began collecting race/ethnicity data in 1997.

Table 1. Sources of publicly accessible data related to IT use in the home

Source	Survey title	Methodology	Type of data collected
CommerceNet	CommerceNet/Nielsen Internet Demographic Survey	Probability sample; random digit dial telephone survey of ~5,000 Americans and Canadians aged 16 and over. Conducted semiannually since 1995.	Computer access; Internet access; main focus on Internet user characteristics and Internet usage patterns.
Cyber Dialogue[1]	American Internet User Survey	Probability sample; random digit dial telephone survey of ~13,000 households; in-depth surveys of ~2,000 Americans aged 18 and over. Conducted semiannually since 1994.	Computer access; Internet access; main focus on Internet user characteristics and Internet usage patterns.
Graphics, Visualization, and Usability Center at Georgia Tech	WWW User Survey	Nonprobability sample; voluntary, Web-based questionnaire widely advertised on the Internet. Conducted semiannually since 1994; respondents now number ~5,000.	Internet only; highly detailed user characteristics and general usage patterns.
International Data Corporation	Work-At-Home Survey	Probability sample; random digit dial telephone survey of ~2,000 U.S. households. Conducted annually since 1986.	Nature of home working; technology acquisition and use; user characteristics; attitudes; telecommuting.
The Pew Research Center for the People and the Press	1998 Technology Survey; Technology in the American Home Survey	Probability sample; random digit dial telephone surveys of ~1,200–3,000 Americans age 18 and over. Surveys conducted periodically from 1994–98.	Computer access; Internet access; user characteristics; computer usage patterns; Internet usage patterns.
U.S. Bureau of the Census	Current Population Survey, computer and Internet supplements	Probability sample; telephone or personal interviews with ~47,000 households. Surveys conducted in 1984, 1989, 1993, 1994, 1997, 1998.	Computer access; Internet access; user characteristics; computer usage patterns; Internet usage patterns.
National Science Foundation	Survey of Public Attitudes Toward and Understanding of Science and Technology	Probability sample; random digit dial telephone survey of approximately 2,000 adults residing in the U.S. conducted biennially since 1972; computer-related questions added in 1983.	Computer access; Internet access; user characteristics; some computer and Internet usage patterns.

[1] Cyber Dialogue also fields the Cybercitizen Finance and Cybercitizen Health Surveys. The methodologies for these differ from the American Internet User Survey and focus more narrowly on the use of the Internet for personal finance and health purposes.

In sum, the ability to do a comprehensive analysis of access to, and use of, IT in the home is hampered by two crucial factors: the absence of routine, detailed data collection on home computers and computing; and a bias toward proprietary databases with limited publication potential. The one Internet survey that is conducted regularly and freely available, the WWW User Survey, is a nonprobability sample; it also lacks the detail and depth of the commercial surveys. The CPS computer and Internet supplements and the Pew surveys on technology in the American home have good potential as comprehensive sources of home computer and Internet data, but neither set of surveys is conducted regularly. In addition, neither the CPS or Pew survey items explicitly address the outcomes or impacts of IT in the home; the data collected are largely descriptive and are not focused on the consequences of IT use.

EXISTING LITERATURE

The literature on the impacts of IT in the home can be organized into three broad categories:

- philosophical and speculative literature about outcomes;
- conceptual literature that tries to provide heuristic models for analyzing home IT diffusion, adoption, use, and outcomes; and
- empirical research related to these phenomena.

In general, this analysis excluded philosophical and speculative literature. It identified 30 major conceptual and empirical works related to the adoption and impacts of IT in the home. Appendix B presents a methodological overview and annotated bibliography of these works; a subject bibliography is presented in appendix C. The empirical literature is summarized briefly below; the conceptual literature is synthesized in the following section.

The empirical research comprises three distinctive types of studies. One group of studies attempts to measure overall diffusion and adoption rates of IT in the home (Clemente 1998, Hoffman, Kalsbeek, and Novak 1996, NTIA 1995, and NTIA 1998). Another group of studies can be characterized as research on the early adoption of home computers dating to the early to mid-1980s (Caron, Giroux, and Douzou 1989; Dickerson and Gentry 1983; Giacquinta, Bauer, and Levin 1993; McQuarrie 1989; Riccobono 1986; and Vitalari, Venkatesh, and Gronhaug 1985). A third body of research focuses almost exclusively on Internet adoption patterns and usage behaviors (Clemente 1998; Egger and Rauterberg 1996; Hill and Hughes 1998; Hoffman and Novak 1998; Katz and Aspden 1997; Kraut et al. 1996; Kraut, Lunmark et al. 1998; and Kraut, Mukhopadhyay et al. 1998). The major empirical works identified by this study are presented in table 2, together with a brief description of their purpose, research dates, methods, and ability to be generalized to a population outside their sample frames.

Two major research programs are currently under way that directly pertain to the adoption and impacts of IT in the home. The HomeNet study based at Carnegie Mellon University is a longitudinal study of approximately 100 families and their Internet use. The participating families were given subsidized computers, free Internet access, and computer/Internet training as a way of eliminating the socioeconomic and technical barriers to home IT access and use. Data are collected from a variety of surveys, home interviews, and electronic logs; although they cannot be generalized to the U.S. population as a whole, the HomeNet findings are nonetheless highly suggestive of American Internet behaviors. For more information, see Kraut et al. (1996) and the HomeNet home page at http://homenet.andrew.cmu.edu/progress/.

The second study is the National Outlook for Automation in the Home (NOAH), conducted by the Center for Research on Information Technology and Organizations at the University of California–Irvine. Project NOAH has two phases; the first was a 2-year longitudinal study of computer owners; the second, which is currently under way, is primarily focused on assessing the use of new IT and media in the home and their impacts on family and work life. For more detail, see the Project NOAH home page at http://www.crito.uci.edu/noah/.

Table 2. Major empirical works related to adoption, use, and impacts of IT in the home

Author	Purpose	Year of data	Research design	Can be generalized beyond sample
Caron, Giroux, & Douzou (1989)	To evaluate dynamics of home computer adoption and use	1983, 1985	Mail questionnaire to 4,300 French-Canadian viewers of an educational computer program aired in Quebec	No
Clemente (1998)	To profile Americans' Internet usage patterns	1994–97	American Internet User Survey, a national random digit dial telephone survey of ~13,000 respondent households	Yes
Dickerson & Gentry (1983)	To profile PC adopters based on technological experience and creativity	1981	Mail questionnaire to ~1,000 members of a computer club and subscribers to *Psychology Today;* demographic and psychographic variables compared for adopters and nonadopters	No
Egger & Rauterberg (1996)	To explore whether heavy use of the Internet reflects addictive behavior	1996	Swiss-based survey publicized and posted on the Web for voluntary participation	No
Giacquinta, Bauer, & Levin (1993)	To analyze how children use the computer at home for educational purposes	1984–86	Case studies of 70 middle/upper middle class families in the tri-state New York City area; content analysis of field diaries and interviews	No
Gurstein (1991)	To assess the impact of home-based computer work on the home	1989	Survey of 45 homeworkers and 9 office workers in California	No
Hill & Hughes (1998)	To compare Internet political activists to the general public and Internet users who are not politically active	1995–96	Statistical analysis of the Pew Research Center for the People & the Press survey data on IT in the American home; data are derived from national random digit dial telephone surveys of ~3,000 individuals	Yes
Hoffman, Kalsbeek, & Novak (1996)	To provide baseline data on the size of the Internet population	1995	Statistical analysis of the CommerceNet/Nielsen Internet Demographic Survey, a national random digit dial telephone survey of ~6,000 respondents	Yes
Katz & Aspden (1997)	To determine how Internet use affects community involvement	1995	Random digit dial phone survey of 2,500 households	Not available to determine
Kraut et al. (1996)	To provide a 1-year snapshot of Internet usage patterns by families	1995–96	Analysis of data obtained for ~48 families from the HomeNet field trial of residential Internet use, a detailed study of approximately 100 families in Pittsburgh, PA and their Internet usage patterns	No

Table 2. Major empirical works related to adoption, use, and impacts of IT in the home

Author	Purpose	Year of data	Research design	Can be generalized beyond sample
Kraut, Lundmark et al. (1998)	To determine the relationship between extensive Internet use, social involvement, and psychological well-being	1995–96	HomeNet field trial of residential Internet use, a detailed study of approximately 100 families in Pittsburgh, PA and their Internet usage patterns	No
Kraut, Mukhopadhyay et al. (1998)	To determine the relative importance of interpersonal communication, information acquisition, and entertainment to Internet users	1995	HomeNet field trial of residential Internet use, a detailed study of ~100 families in Pittsburgh and their Internet usage patterns	No
McQuarrie (1989)	To explain variation in PC usage patterns based on product factors, social integration, and adopter resources	1984	Mail surveys of computer owners who returned a coupon to a market research firm; ~3,500 surveys sent in both the pilot study and main study	No
NTIA (1995)	To present key findings on the degree to which home access to computers and the Internet are becoming universal in the U.S.	1994	Statistical analysis of November 1994 CPS data conducted by the Bureau of the Census; questions cover home computer access and usage and home Internet access and usage	Yes
NTIA (1998)	To present key findings on the degree to which home access to computers and the Internet are becoming universal in the U.S.	1997	Statistical analysis of October 1997 CPS data conducted by the Bureau of the Census; questions cover home computer access and usage and home Internet access and usage	Yes
Novak & Hoffman (1998)	To analyze racial differences in access to, and use of, home computers and the Internet	1996–97	Statistical analysis of CommerceNet/Nielsen Internet Demographic Survey, a national random digit dial telephone survey of ~6,000 respondents	Yes
Riccobono (1986)	To provide a national picture of out-of-school learning activities by Americans and types of learning resources used	1985	Home Information Technology Study conducted by the Department of Education, a random digit dial telephone survey of ~4,700 respondents	Yes
Riley & McCloskey (1996)	To report the results of a 6-month pilot program on telecommuting conducted by GTE Corp.	1993	Survey data obtained from 120 project participants	No
Robinson, Barth, & Kohut (1997)	To determine if home computing and Internet use displaces the mass media as a source of news	1994–95	Statistical analysis of the Pew Research Center for the People & the Press survey data on IT in the American home; data are derived from national random digit dial telephone surveys of ~3,000 individuals	Yes
Venkatesh & Vitalari (1987)	To analyze how households adopt new PC technologies and patterns in PC usage	1984	Survey data obtained from 282 computer club members in Orange County, CA	No